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of the

UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Contents

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Preventing Birds From Damaging Greens

By W. L. McAtee

Bureau of the Biological Survey, United States Department of Agriculture

Although a number of species of birds may make holes in putting greens, all of them, as far as we know, do so for the purpose of obtaining food. This food may be ants, beetle larvae, cutworms, or possibly other insects, the presence of which in a putting green is undesirable. The excavating operations of the birds in securing these larvae should therefore be looked upon with tolerance, for they have as their object the capture of pests which in the long run if unchecked would do far more damage to the greens.

Several instances have come to attention in the past season where persons in charge of golf greens that were being dug into by birds adopted the first method of combatting the trouble that occurred to them, namely, killing the birds. The facts stated in the preceding paragraph clearly indicate that this is the wrong policy, the right one by contrast being direct action for the destruction or removal of the insect pests themselves, the presence of which in the greens is what attracts the birds. Unauthorized killing of birds also is likely to involve the persons doing it in violation of either State or Federal laws protecting birds, for which penalties are provided. In cases where it is really necessary to kill birds of protected species, arrangements usually can be made to get permits authorizing the procedure from the United States Biological Survey in the case of migratory birds, and from the State conservation departments or similar organizations in the case of resident birds.

An investigation of an instance of birds digging in putting greens was made on the experimental turf garden at Arlington Farm, Va., in August, 1929, by Mr. Clarence Cottam, of the United States Biological Survey. Starlings, killdeers, and robins were observed feeding on the plots. The killdeers seemed to do no drilling whatever. The robins secured most of their food from the surface but did occasionally peck into the sod, and the holes were too small to cause any appreciable damage. The starlings seemed to be largely responsible for the damage, and they sometimes dug rather large holes in the sod in their search for food. A number of furrows two inches or more long and an inch deep were observed to be made by them. Specimens of all of the birds mentioned were collected, and it was demonstrated by examination of their stomachs that the principal food attracting them to the grass plots was cutworms. It is believed, therefore, that if proper insecticidal measures are taken against the cutworms the digging operations of birds in the turf plots will cease, and it is hoped that persons in charge of golf greens will adopt this procedure.

It should not be forgotten that aside from the matter of the holes, the work of the birds in and about golf greens is likely to be entirely beneficial. The destruction of cutworms in itself is very desirable, as they are certainly not in golf greens for the good of the turf. The birds collected on Arlington Farm had eaten a good many ants, insects which are constantly throwing up small mounds of dirt on the surface of greens, much to the disgust of golfers. Nearly a third of the food of the starlings collected consisted of ants. Billbugs and grasshoppers, insects also injurious to grass, were taken by the birds; and as is well known, robins are great consumers of earthworms, creatures which greenkeepers desire to eliminate from putting turf. As a final thought we need only urge what is apparent to all that the general value of insectivorous birds is such that aggressive action against them should not be undertaken except after thorough investigation and for important reasons. Fight insects directly and you will find that birds are your allies in the campaign.

Japanese Beetle Parasites Collected in Native Land

Four large shipments of Japanese beetle parasites were received recently by the Bureau of Entomology of the United States Department of Agriculture. They came from the field laboratory of the bureau at Yokohama, Japan, and were sent to the Japanese beetle laboratory at Moorestown, N. J.

Few people understand the difficulty and cost of obtaining, storing, and shipping these parasites. To get them, T. R. Gardner, entomologist in charge of the Yokohama laboratory, and his staff of Japanese assistants, had to search for weeks to collect the necessary species.

Two of these shipments consisted of Japanese beetle larvae parasitized by two species of flies. The other two shipments were adult wasps of a species native to Korea. In the case of one species of flies, the female flies had first to be caught, and then dissected under a microscope. Two or three of the minute larvae found within the larval sac were then placed on each grub of the host "Popillia" or Japanese beetle. These minute larvae would almost immediately enter their host. The grubs were then stored in "grub plots" out of doors for the winter, and shipment was made the following spring.

The shipments of wasps were in tins provided with all the necessities of life. They arrived in excellent condition. The first shipment, of 5,285 wasps, came through with 86.5 per cent alive; the second, about 5,700 somewhat older adults, with 64.7 per cent alive.

Most careful preparations must be made for expediting these parasites across the Pacific and this continent. Cablegrams are sent to clear the way for rapid delivery, and when once started they move on their route as fast as mail. In the meantime the laboratory here makes preparations for receiving them, and by the time they arrive is ready to store them properly or liberate them immediately, according to the species and the season. In some cases parasites received at one time of year must be held over until the proper time has come in the life cycle of the host beetles for their attack to be effective. It has been found, too, that better results are obtained when very large numbers of parasites are liberated at one time.

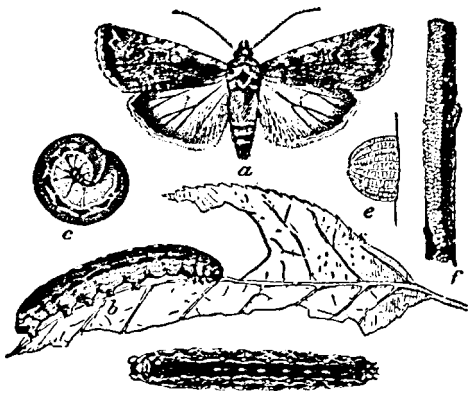
Cutworms on Golf Greens

By W. R. Walton

Bureau of Entomology, United States Department of Agriculture

Sodlands constitute the natural home of many of the most injurious species of cutworms inhabiting the United States east of the Mississippi River. It should not therefore cause surprise when they are found feeding on golf greens in large numbers. An instance of this kind is reported in this issue of the Bulletin, which occurred on the greens at the experimental farms, Arlington, Va., in which attention was focused on the matter through the useful agency of insectivorous birds. Fortunately the cutworm pest is one which can be rather easily eliminated in the great majority of cases by the application of simple poisoning methods, as herein described.

The annual or seasonal history of many common cutworms includes either one or two generations of the insects a year. The eggs are laid commonly on grass in middle or late summer, and the worms feed until partly mature during the late summer and autumn. Then they burrow into the soil, make a cavity or cell, and hibernate or sleep during the winter. In March or April they again become active and feed even more hungrily than in the fall. It may be seen from this program that where they have been found injurious in the fall, further injury may be expected in the spring unless successful poisoning operations were conducted in the fall.



Variegated cutworm (Peridroma margaritosa): (a) moth; (b) normal form of caterpillar, side view; (c) same in curved position; (d) dark form, view of back; (e) greatly enlarged egg, seen from side; (f) egg mass on twig.

The worms may be killed by spraying or sprinkling the infested turf with a solution of two pounds of powdered arsenate of lead in 50 gallons of water, or by the spreading of poisoned baits prepared in the following manner:

Wheat bran	50 pounds
Paris green or crude arsenic	2 pounds
Blackstrap molasses	2 quarts
Water	2 to 4 gallons or more as needed.

Mix the poison and the bran thoroughly together, in a dry state, add the diluted molasses, and stir vigorously until thoroughly mixed. Distribute this bait broadcast over the infested area. In case bran can not readily be obtained, middlings or alfalfa meal may be successfully substituted.

Where bran or other fillers for poisoned baits are prohibitively expensive or difficult to obtain in sufficient quantities, they may be diluted with equal parts of fresh hardwood sawdust. The formula for poisoned bait prepared in this manner is as follows:

Paris green or white arsenic	2 pounds
Fresh hardwood sawdust	25 pounds
Wheat bran	25 pounds
Molasses	2 quarts
Water	4 to 8 quarts or more as needed.

This mixture is not quite as efficient as the poisoned bait containing the entire amount of bran, but it has shown good results and may be used to advantage when necessary. Pine sawdust should not be used, as this seems to repel the insects.

Where only a small quantity of poisoned bait is required the following formula will be found most convenient:

White arsenic or Paris green	1 pound
Dry bran	1 peck
Molasses	1 pint
Water	2 to 4 quarts or more as needed.

It is often advantageous to allow the mash thus obtained to stand for several hours before using; this seems to result in greater effectiveness.

In areas known to be infested the distribution of this bait should be started early in the season so that the cutworms may be eliminated as quickly as possible. During the warm spring months cutworms do most of their feeding at night and burrow into the soil to the depth of an inch or two during the day; the bait will, therefore, usually be more effective if applied during the late afternoon or early evening hours.

Caution.—Poisoned bait should be distributed thinly. Domestic animals, including fowls, should be prevented from eating it. Arsenic and Paris green are poisonous to animals.

The United States Department of Agriculture receives about 15,000 letters a day at Washington. Most of these are requests for information on technical matters pertaining to agriculture and other work under the control of the Department, including the activities of the Weather Bureau, the Biological Survey, the Forest Service, the Bureau of Home Economics, and the Food and Drug Administration. The bulk of these inquiries are answered by printed circulars and pamphlets. About 30,000,000 publications of this kind are mailed annually by the Department in answer to inquiries. Less than half of these are requested by farmers. More than 1,000 news items are supplied annually by the Department to newspapers and other private publications. At least 3,500 persons in the country write agricultural news and feature articles, drawing chiefly on the Department of Agriculture for their information. At noon each week day a specialist of the Department broadcasts a timely talk over the radio, through the National Broadcasting Company, which has linked 39 stations for these daily programs from Washington. In addition, weather reports are broadcast daily by 215 stations. Market news is broadcast daily by 110 stations. Syndicate information obtained from the Department is broadcast by more than 150 stations. All told, 290 of the 610 broadcasting stations in the United States cooperate with the Department of Agriculture.

Green Section Summer Meetings

During August the Green Section held meetings for green-committee members and greenkeepers at the Arlington turf garden, near Washington, and at the new Green Section experimental station in the Chicago district. Both of these meetings were well attended and much interest was displayed in the experimental work being conducted on various turf grasses. The Washington meeting was held on Monday and Tuesday, August 19 and 20, and was conducted in cooperation with the Mid-Atlantic Association of Greenkeepers. The Chicago meeting was held on August 26, in cooperation with the Chicago District Golf Association Green Section and the Mid-West Greenkeepers' Association.

The Arlington Turf Garden prepared for the Green Section meeting on August 19. White labels marked the plots where some of the more interesting tests were being made.

Washington Meeting

Visitors assembled at the Arlington turf garden Monday morning, and in body had the main features of the experimental work briefly explained to them. There were about 70 in attendance, After this survey of the garden smaller groups assembled to discuss more thoroughly the phases of the work in which they were particularly interested. This informal discussion continued until early afternoon. Four of the local golf clubs (Columbia, Burning Tree, Manor, and Washington) kindly extended the privileges of their courses to visitors who wished to play golf during the afternoon of Monday. Many availed themselves of this opportunity, while some returned to the turf garden for further observation and discussion of the experimental work.

In the evening the Mid-Atlantic Association of Greenkeepers held its monthly meeting, to which all who attended the Green Section meeting were invited. The meeting was preceded by a dinner and practically all who attended the meeting at Arlington were present at the dinner and evening discussion. The chief feature of this meeting was a talk on bent seed by Mr. F. H. Hillman, of the Seed Testing Laboratory, United States Department of Agriculture. Mr. Hillman is acknowledged to be the greatest authority on seed of many of the grasses, including those of chief interest to golf courses. He had recently returned from visits through some of the new bent-seed

producing areas of this country and Canada and therefore was able to present during his discussion some of the most recent information available. His talk had so much of interest and value to golf courses that we hope to incorporate it completely in an early issue of the Bulletin. During the evening Mr. Hillman answered many questions which were presented. Afterward the meeting was open for a general discussion of topics of interest to those in attendance.

Many of the visitors remained for the second day of the program, which was entirely in charge of the Mid-Atlantic Association of Greenkeepers. This organization acted as hosts and arranged an instructive tour of some of the interesting golf courses in the Washington district. Practical problems were presented and discussed on the courses as the party went about from one course to another. The trip proved of interest to all who were able to avail themselves of the opportunity.

At the Arlington turf garden many of the usual mid-summer injuries to turf were not in evidence. In mid-August, when brown-patch damage is usually very conspicuous at Arlington, control treatments show their true values. However, this season brown-patch was less severe at Arlington and the experimental brown-patch treatments therefore did not show much of interest. The fertilizer plots also did not have the striking contrast that is ordinarily in evidence at this season. Nevertheless the visitors found many features of the work to hold their interest, as was clearly indicated by the late hour they lingered before departing for lunch, in spite of the fact that Washington is on standard time and many were in the habit of having lunch on the earlier daylight-saving schedule.

Some of the visitors at the Washington meeting assembled around one of the demonstrations at the Arlington Turf Garden.

The plots with the various strains of grasses attracted most attention. The large plots which are maintained in putting green condition and equipped with cups naturally were of great interest, and visitors were able to test their skill and prejudices on several different strains of bent planted with the stolon method or with seed. The Arnott mechanical putter was used to show the comparative length of putt on the up-hill and down-hill grades of the different grasses. There was much interest in the test of the new ball in comparison with the present ball for putting purposes. Many interest-

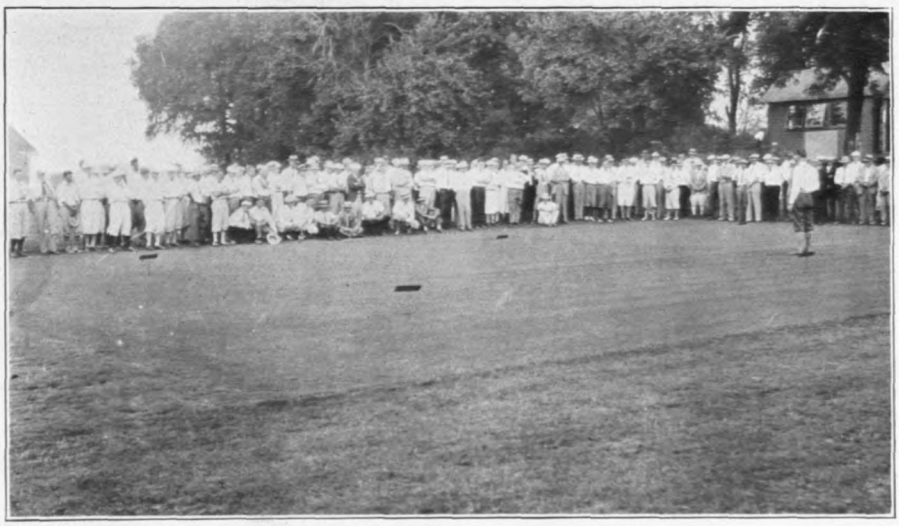
ing questions and statements were brought forth in going over these plots. Briefly the consensus of opinion seemed to be that if the ball is hit properly it will find its way into the cup on almost any variety of grass which is properly cared for. It was evident, however, that certain varieties of grasses required much more attention to keep them in good condition than do other good turf grasses. The fescue plot was by far the worst in this series. Certainly none of the visitors would be likely to plant greens of fescue after comparing this plot with the plots of bent grasses nearby. The velvet bent plot attracted much attention and brought out many favorable comments. Judging from the interest shown in that plot we are willing to predict that velvet bent is due for some extensive tests on golf courses in the near future. There was a large number of plots containing a collection of many different strains of both creeping and velvet bent. These strains are being observed at Arlington for quality of turf, disease resistance, and other characteristics before they are distributed to golf courses. Even a casual survey of these plots showed that some of them had much promise while others would probably soon be discarded.

In connection with the tests with the varieties of grasses the visitors were shown the system of identifying strains of creeping bent. This system has been in use at the Arlington turf garden for the past two years and is proving very effective in clearing up the confusion which is in evidence throughout the country as to the identity of many strains of bent which are being propagated on a commercial scale. A number of samples sent in by golf clubs and by companies raising bent commercially are now being tested at Arlington. When a sample is sent in for identification it is planted in one of the identification rows and next to it is planted a similar sample from the original stock of the common strains, such as Washington, Metropolitan, Virginia, and Columbia. After growing for some time, the turf to be identified grows away from the soil sent in with the sample. When it is thoroughly established on the new soil it is possible to identify the grass readily, for any differences in growth due to soil and climate are eliminated, since the sample to be identified and the sample from Arlington stock are growing side by side on the same soil. It was very clear to visitors that many of the clubs which have purchased creeping bent as the Washington strain in reality have the Virginia bent, which the Green Section does not recommend. There were several plugs sent in by courses as Washington bent which visitors could readily see proved to be the Virginia bent when put in an identification row. One sample which caused much amusement had been received from a Western club which had planted greens with supposedly seaside bent seed for which they had paid over $2 a pound. The sample of turf which this club sent from its greens showed a thick growth of timothy and redtop but no evidence whatever of any seaside bent.

Another series of tests which was of much interest was that demonstrating the weed content of compost. The top soil from some plots on the garden had been removed to a depth of 3 inches. Half of the area was replaced with ordinary poorly prepared compost, whereas steamed compost had been used in the other half. The resultant development of weed growth proved enlightening. The plots containing the unsteamed compost were covered with weeds, particularly the various kinds of crab grass. The plots where the steamed

compost had been used had only a light scattering of weeds. A series of flats containing samples of compost from various courses in the Washington district were also on exhibition. These flats had been cared for in a similar manner, but the growth of weeds was decidedly different. In a few flats there was only an occasional weed, whereas others contained a dense growth of numerous kinds of weeds. It was plainly evident that on some courses every time compost is applied the greenkeeper is planting a large supply of seed to keep the weed-pickers busy later in the summer. It is planned to publish photographs of these tests in a future number of the Bulletin.

Although diseases were not very prevalent, visitors had an opportunity to compare the symptoms of small brown-patch and Pythium. These two diseases are frequently confused and it is difficult to distinguish between them merely from a verbal description. Where two diseases occur together on the same plot the distinctive characteristics can be readily pointed out. Some other tests which attracted attention were those with different chemicals for controlling the zonate eye-spot disease on Virginia bent. On some plots the control of this disease was very marked.



Visitors at the Green Section meeting at the new Green Section Experimental Turf Garden, West Lake Forest, Ill.

During the morning a demonstration was given of the influence of structure on the movement of water through the soil. A set of tubes containing respectively dry sand, sandy loam, loam, and clay, was lowered into a pan of water on the day preceding the meeting. The tops of the columns of water had been marked on the tubes at different intervals of time, showing speed of movement through the soil. A tube of sand and another of loam were lowered into the water while the visitors were assembled, and by returning at intervals during the morning the visitors were able to watch the rate of movement through these soils. This demonstration clearly pointed out why it is necessary to use different methods of watering on a soil of a sandy type as compared with one containing a large proportion of fine particles of clay.

During the morning plugs were removed from a number of plots on the garden. These plugs showed a decided difference in root growth among different grasses as well as among plots receiving different chemicals.

Chicago Meeting

The meeting in Chicago was the first summer gathering sponsored by the Green Section in the Middle West. The attendance of 250 indicated that there was a keen interest in this type of gathering in that section of the country. The new Green Section experimental turf garden was started in the Chicago district last September, and therefore all of the tests were on young turf. Only half of the garden had been planted at the time of this meeting, nevertheless the visitors apparently were able to find much of interest.

A group gathered about the first tee of the Mill Road Farm Golf Course waiting to tee off in the Green Section tournament on August 26.

As in Washington, the first part of the program was devoted to a survey of the experimental garden. The fertilizer and other chemical tests did not show very striking results, due to the fact that the tests had been under way only a single season. The fertilizer plots showed very little difference except that, as at Washington, the plots receiving nitrogen in a readily available form were superior to those receiving other fertilizers. Such tests are of greater interest after they have been continued for a period of years and will no doubt show more interesting contrasts at future meetings.

As at Arlington, diseases were not much in evidence and therefore control treatments could not show anything of interest. Plots of various grasses, however, were in condition to permit a brief comparison of the relative merits of various types of grasses planted by the seed or stolon methods. The Arnott mechanical putter was used to compare the length of putt on the different grasses on similar grades. A comparison of the old and new model ball was also made at this meeting.

One of the features of the program was the demonstration of the root development of grasses cut at different heights. A study of this

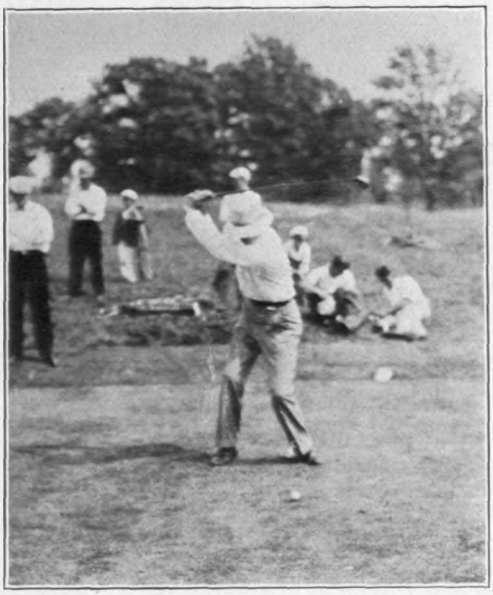
is being conducted in the botany department of the University of Chicago and will be reported more in detail in some later issue of the Bulletin. Judging from the interest shown in the demonstration it is perhaps safe to predict that some clubs which sent delegates to the meeting will find their fairways somewhat longer during at least part of the growing season. The recent tendency to keep setting fairway mowing units lower and lower will probably receive something of a jolt if future Green Section work at the University of Chicago supports the preliminary results already obtained.

As at Arlington, during the morning a demonstration was given of the influence of structure on the movement of water through the soil.

After the morning session at the experimental plots, visitors had an opportunity to walk through Mr. Lasker's gardens while on their way to lunch, which was held on his estate.

During the afternoon most of the visitors availed themselves of the opportunity to play Mr. Lasker's course in the Green Section tournament. Many of those who did not play returned to the turf garden for future discussion and then went on a short tour of inspection about the golf course.

After the tournament the delegates went to the Onwentsia Club for dinner and a meeting sponsored by the Green Section of the Chicago District Golf Association. During the course of the evening prizes donated by the United States Golf Association and the Mid-West Greenkeepers' Association were awarded to the successful competitors in the afternoon's tournament. A general informal discussion of golf turf problems followed the dinner. The Mid-West Greenkeepers' Association invited those in attendance to visit the local courses on the following day.



Alex Pirie starting from the first tee in the Green Section tournament after he had completed his task of making arrangements for the tournament.

One or more trees to each tee not only add to the beauty of the landscape but are a blessing to both grass and golfers on midsummer afternoons. The fine turf grasses as well as humans enjoy partial shade. Crab grass especially is vastly easier to control under shaded conditions, and thus less injurious to the turf of the tee. The trees of course should be planted on the south side of the tee to provide the proper shade.

QUESTIONS AND ANSWERS

All questions sent to the Green Section will be answered in a letter to the writer as promptly as possible. The more interesting of these questions, with concise answers, will appear in this column. If your experience leads you to disagree with any answer given in this column, it is your privilege and duty to write to the Green Section.

While most of the answers are of general application, please bear in mind that each recommendation is intended specifically for the locality designated at the end of the question.

Discoloration of turf by cold weather.—Within the last few weeks preceding this date, May 11, our putting greens have taken on a dull brown color, and although we have given them two applications of sulphate of ammonia at the rate of 10 pounds to the green they do not show improvement. We are of the opinion that the brown color is due to the cold nights, as there has been a slight frost at nights. Have you any suggestions as to how we might take care of this condition? (Illinois.)

ANSWER.—You do not state what kind of grass you have on your greens. Some strains of bent are apt to turn a dark color during cold weather. This is particularly apt to occur with the Washington strain, which often turns a dark color without frost, mere cold winds being sufficient to bring this about. Discoloration is often more likely to occur if the cold comes soon after an application of sulphate of ammonia or other quick-acting fertilizers. If it is cold that is affecting your greens you will find that the entire surface is turned off color, rather than patches, such as occur when diseases affect turf. There is no treatment which will help greens so discolored. As soon as warm weather returns you will find that the grass will again take on its healthy green color.

Bulbous bluegrass for winter greens in the South.—Would bulbous bluegrass be worth sowing on Bermuda greens in this locality for use as a winter putting turf? We understand it is very satisfactory for this purpose in Arizona, beginning to grow in the fall when the Bermuda grass becomes dormant. It is rather expensive, costing about 65 cents a pound. (Tennessee.)

ANSWER.—We have no information as to what success might be expected from bulbous bluegrass (*Poa bulbosa*) when sown on Bermuda greens in your locality. Its value varies for this purpose with climate. At Washington, D. C., it is not entirely satisfactory, as it does not become green soon enough in the fall after frost attacks the Bermuda grass. In Florida also it is not entirely satisfactory, as the dormant bulbs of the bluegrass seem to be injured to some extent by the summer heat, since the bluegrass does not revive in the winter sufficiently to make a satisfactory turf. We understand, however, that south of Richmond, through the piedmont section, satisfactory results are obtained, the bulbous bluegrass returning when the Bermuda grass goes out with the frost, and disappearing as the Bermuda resumes growth in the spring. The use of bulbous bluegrass in your locality would therefore be an experiment, but might be worth trying on a small scale.

Use of highly concentrated fertilizers; roles of nitrogen, phosphoric acid, and potash in plant nutrition.—We are interested in using highly concentrated fertilizers, and in particular a certain commercial fertilizer which is claimed to contain 17 per cent nitrogen, 33 per cent phosphoric acid, and 17 per cent potash. These figures make a total of 67 per cent combined nitrogen, phosphoric acid, and potash, which is greater than the 46 per cent nitrogen alone contained in urea, 35 per cent nitrogen alone in nitrate of ammonia, 20 per cent nitrogen alone in sulphate of ammonia, 58 per cent combined nitrogen and potash in nitrate of potash, and 59 per cent combined nitrogen and phosphoric acid in phosphate of ammonia, as listed on page 112 of the Bulletin for June, 1928. We appreciate that for certain conditions nitrogen is more desirable than phosphoric acid or potash but do not quite understand the roles of the three fertilizing elements nitrogen, phosphoric acid, and potash, in plant nutrition nor what value or superiority each may have as applied to golf course turf. Our greens are all of creeping bent and are dressed frequently with compost containing a fixed percentage of sulphate of ammonia. Our fairways are largely Kentucky bluegrass and clover, with a small percentage of bent and fescue. These likewise are being dressed with compost containing a fixed percentage of sulphate of ammonia. May any additional benefits be expected from the use of a highly concentrated complete fertilizer? If you would recommend the use of the commercial fertilizer to which we have referred, at what rate should it be applied to an acre? (Kentucky.)

ANSWER.—It is generally accepted that nitrogen is conducive to succulent, leafy growth, and if it is used excessively with some plants nothing but stalks and leaves will be produced, to the detriment of the fruit. Phosphoric acid is considered to be used by the plant in root development and in the stiffening and hardening of the plant, as in the stiff stalks, veins, and seed coats. Potash is useful in the formation of the stiffer structures of the plant, the coloring in the plant, and the structure of the fruit and seed. It will therefore be seen that in turf work, where we are not aiming to produce an abundance of hard stalks and fruit but rather an abundance of leaves, the nitrogenous fertilizers possess higher value. When, however, seedings are first made it is well to use some fertilizer containing phosphoric acid, since a good root development is required in order to establish a good stand of grass. Once the roots are developed, turf grasses are better able to obtain sufficient phosphorus from the soil. At certain times the plant requires some phosphorus and potash, and unless these are present in the soil in sufficient quantities the plant will suffer. Usually the soil on the fairways contains sufficient phosphorus and potash, and the supply is not depleted, due to the clippings being left on the ground and thereby returning these fertilizing elements to the soil. On putting greens, however, where clippings are removed, the situation is different. A good top-dressing of compost usually contains sufficient phosphorus and potash to take care of the loss. However, it is wise to apply occasionally a complete fertilizer, containing nitrogen, phosphoric acid, and potash, to putting greens.

If sulphate of ammonia is applied to fairways at the rate of 200 pounds to the acre, as indicated in the Bulletin for June, 1928, it would take 235 pounds of the commercial fertilizer to which you

refer, containing 17 per cent nitrogen, to supply an equal amount of nitrogen. Usually muriate of potash is employed to supply the potash in mixed fertilizers, and a certain allowance in the rate of application is made for the potash contained so as to forestall possible injury to the grass from burning that might result from the muriate of potash, and we would accordingly recommend a rate of 150 to 190 pounds to the acre for the fertilizer in question. The advisability of using the commercial fertilizer you refer to depends somewhat on its price. We think the chief value of fertilizers for golf courses is in their nitrogen content, and recommend that fertilizers be bought for the most part on a nitrogen-content basis. The particular fertilizer you are considering contains more phosphoric acid and potash, in comparison with nitrogen, than is required on golf courses, and hence we would not recommend it for steady use. It could, however, be applied occasionally either to putting greens or fairways with very good results. Sulphate of ammonia and compost supply putting greens with abundant nitrogen and usually with sufficient phosphorus and potash also, and are therefore recommended for continued use.

Winter greens in the South.—What appears to be the customary method of providing winter putting turf in this section? (North Carolina.)

ANSWER.—Bermuda grass is the chief grass for both fairways and greens from southern Virginia southward, although Kentucky bluegrass does appear in the fall on the heavier soils of North Carolina and will form fair winter turf if fertilized in the fall. In the summer Bermuda grass and crab grass are the predominant turf grasses. The crab grass will displace the Bermuda if the latter is not occasionally fertilized. The Bermuda turf on putting greens is used from April or May until the latter part of October. On the first of October the custom is to skin the Bermuda grass off half or all of each green by means of sharp hoes. The area thus prepared usually is then sown with Italian or domestic-grown rye grass. The rate of seeding is fairly heavy, usually amounting to as much as 30 pounds to 1,000 square feet. Rye grass quickly establishes itself and gives a fair winter putting surface. The growing of rye grass in the winter however usually injures the Bermuda grass, which becomes weaker each year. For that reason on many courses only half of the green is used in the winter. Those clubs that use the whole green reseed with Bermuda grass in early spring.

Controlling snow-mold.—We should appreciate it if you would advise us what information you now have on snow-mold, or winter brown-patch. This is our principal problem in this section. (Minnesota.)

ANSWER.—In regions where this disease is serious it is well to treat greens with at least 3 ounces of corrosive sublimate to each 1,000 square feet of turf. Powdered calomel can be used for the same purpose. This treatment should be made as late in the fall as it is possible to work on the greens. This will avoid washing of the chemical from the soil by late fall or early winter rains. The chemical can be applied safely at this rate, or even in much larger quantities, at that time of the year. It may be applied in liquid form or mixed thoroughly with a light application of compost. In some of

the tests last year it was found that treatments in late winter or early spring checked the damage to some extent. The control was, however, by no means as effective as was the fall application. Since it is difficult to use spraying equipment on greens when snow is melting it is wise to store some dry compost or sand with which to mix powdered corrosive sublimate if it should prove necessary to give a further treatment in late winter. A mixture with sand or compost can be easily and safely applied whenever the snow-mold is found to be active. The nature and control of the disease is discussed in detail in the October, 1928, number of the Bulletin.

Borax as an ant killer.—To what extent and over how long a period of time would borax used as an ant killer injure the turf or soil? We have been using it with sugar made into a syrup, three parts of sugar to two parts of borax. We punch a hole in the nest and with an oil can inject a few drops. It seems to be far more effective than the carbon bisulphide which we have been using in connection with it. However the grass seems to yellow worse than with the bisulphide. We find it particularly useful in the colonies of ants one often finds in the areas around the green where injury to the turf is a minor matter. It seems to kill most of the ants and prevents them from working in the green. Would the injurious effect of the borax be gone the next season? (Massachusetts.)

ANSWER.—There is very little information available as to the lasting harmful effect of borax on turf. We have experimented with this chemical and have observed the very noticeable yellowing of turf which develops a few days after the material is applied. Ordinarily we have found that in a comparatively short time the turf recovers its normal green color. There seems to be no lasting accumulative effect but there has not been sufficient experimental work to justify any general recommendation or condemnation of this chemical for turf work. In the absence of any conclusive information we advise you to use the chemical as sparingly as possible on your best turf.

Controlling goose grass, small crab grass, and yellow foxtail on putting greens.—We are sending you specimens of three grasses which cause us a great deal of trouble on the 18 watered greens of our course. Kindly give us the common and botanical names of these grasses, with suggestions for their control. (Missouri.)

ANSWER.—The grasses which you send us are goose grass (*Eleusine indica*), small crab grass (*Syntherisma ischaemum*), and yellow foxtail (*Chaetochloa lutescens*). Once any of these grasses are established in a putting green the best remedy is hand-weeding. The thickening of the turf on putting greens in the spring also has a great deal to do with the control of all foreign grasses and weeds. Steps should also be taken to prevent their getting into the greens. Such foreign grasses are most commonly introduced on greens in top-dressing material. It is well therefore to test top-dressing material for the presence of weed seeds before applying it to a green. The test can be made by setting out small flats of the material, in a greenhouse or other warm place during cool weather, to see if weed seeds germinate. Weed seeds in top-dressings can be destroyed by thoroughly composting the material and frequently turning the piles or by preparing soil beds which are kept fallowed throughout the summer by frequent cultivation.

Avoid especially the class of literature which has a knowing tone: it is the most poisonous of all. Every good book, or piece of book, is full of admiration and awe. It may contain firm assertion or stern satire, but it never sneers coldly nor asserts haughtily; and it always leads you to reverence or love something with your whole heart.

John Ruskin.